

AMENDMENTS TO THE CLAIMS

1 - 11. (Cancelled)

12. (Currently Amended) A system comprising:

a first computer means coupled to a network means; and

a second computer means coupled to said network means, said second computer means configured to produce ~~comprising a visual display means, said visual display means comprising means for displaying~~ a graphical environment, wherein said graphical environment is based, at least in part, on information transferred from said first computer means to said second computer means over said network means, and human/computer interface means, wherein said human/computer interface means comprises an actuator means, said second computer means further comprising means for interpreting said information repeatedly received from said first computer means over said network means, updating said graphical environment ~~visual display means~~ based, at least in part, on said information, and causing said actuator to generate a physical feel sensation at said human/computer interface means based, at least in part, on said information.

13. (Previously Presented) A system as recited in claim 12 wherein said second computer means input comprises at least one of a position input for said human/computer interface device, and a button click input.

14. (Previously Presented) A system as recited in claim 12 wherein said human/computer interface means coupled to said second computer means includes a local controller means that communicates with said second computer means, a plurality of said actuator means for providing said physical feel sensations.

15. (Previously Presented) A system as recited in claim 14 wherein said second computer means sends a force feedback command to said local controller means that can be parsed by said local controller means such that said controller means can control said actuator means in response to said force feedback command in a control loop with said sensor means.

Claim 16. (Cancelled)

17. (Currently Amended) A method for providing haptic feedback, comprising:

receiving a first computer information from a first computer at a network interface of a second computer over a network, wherein said first computer information comprises information representing a position of a manipulandum ~~user manipulatable object~~,

generating a graphical environment ~~n image to be displayed on a visual display of said second computer~~;

receiving an input information at said second computer from a haptic feedback device;
and

causing a ~~tactile sensation~~ haptic feedback signal to be provided to said haptic feedback device from said second computer, said ~~tactile sensation~~ haptic feedback signal being based, at least in part, on said first computer information and said input information, wherein said haptic feedback signal causes said haptic feedback device to output haptic feedback.

18. (Previously Presented) A method as recited in claim 17 wherein said first computer information includes haptic feedback information indicating a tactile sensation to be output by said second haptic feedback device.

19. (Previously Presented) A method as recited in claim 17 further comprising sending second computer information from said second computer to said first computer over said network.

20. (Previously Presented) A method as recited in claim 19 wherein said second computer information includes said input information from said second haptic feedback device and haptic feedback information indicating a tactile sensation to be output by said first haptic feedback device.

21. (Currently Amended) A method as recited in claim 17 wherein said graphical environment ~~image~~ includes ~~displaying~~ a first graphical object controlled by a user of said first haptic

feedback device, and ~~displaying~~ a second graphical object controlled by a user of said second haptic feedback device.

22. (Original) A method as recited in claim 21 wherein said first and second graphical objects are paddles.

23. (Original) A method as recited in claim 21 wherein said first and second graphical objects are displayed in a web page.

Claim 24. (Cancelled)

25. (Previously Presented) A method as recited in claim 17 wherein said second haptic feedback device includes a local controller that communicates with said second computer, wherein said local controller parses a haptic feedback command sent by said second computer such that said local haptic can control said actuator in response to said haptic feedback command in a control loop with at least one sensor of said second haptic feedback device.

Claim 26. (Cancelled)

27. (Currently Amended) A method for providing physical interaction over a computer network comprising:

enabling a first information comprising an indication of movement of a first manipulandum coupled to a first computer and first feel sensation information indicating a type of force sensation to be output by a network interface coupled to said computer network and said first computer, said first information sent over said computer network to a second manipulandum coupled to a second computer;

causing a first force to be applied to said second manipulandum based at least in part on said indication of movement of said first manipulandum and said first feel sensation information;

enabling a second information comprising an indication of movement of said second manipulandum and second feel sensation information indicating a type of force sensation to be

output by a network interface coupled to said second computer and ~~over~~ said computer network, said second information sent over said computer network to said first manipulandum; and

causing a second force to be applied to said first manipulandum based, at least in part, on said indication of movement of said second manipulandum.

28. (Original) A method as recited in claim 27 further comprising developing an image on a visual display of said first and second computers, said image portraying a graphical environment at least partially responsive to said movement of said first manipulandum or said second manipulandum.

29. (Currently Amended) A method as recited in claim 28 wherein said graphical environment includes a first graphical object controlled by said first manipulandum and a second graphical object controlled by said second manipulandum, and wherein when said first and second graphical objects interact in said graphical environment ~~object~~, forces are applied to said first manipulandum and said second manipulandum.

Claims 30-32. (Cancelled)

33. (Previously Presented) A method as recited in claim 27 wherein said first manipulandum and said second manipulandum are each included in a haptic feedback device, said haptic feedback device including a local controller parsing commands from one of said first and second computers.

34. (Previously Presented) A method as recited in claim 33 wherein said haptic feedback devices each include at least one sensor for determining a position of said manipulandum of said haptic feedback device, and at least one actuator for outputting a force in a degree of freedom of said manipulandum of said haptic feedback device.

Claim 35. (Cancelled)

36. (Currently Amended) A method as recited in claim 38 wherein said first computer receives a first input information from said first haptic feedback device in response to a manipulation of said first haptic feedback device ~~by a first user~~, and wherein said second computer receives a second input information from said second haptic feedback device in response to a manipulation of said second haptic feedback device ~~by a second user~~.

37. (Currently Amended) A method as recited in claim 36 wherein said haptic feedback signal from said first computer and said second computers is based, at least in part, on said input information from said first haptic feedback device and said second haptic feedback devices, respectively.

38. (Currently Amended) A method for providing haptic feedback between a first computer and a second computer comprising:

sending a first computer information to said second computer from a first network interface of said first computer over a network, wherein said first computer information comprises ~~position information describing~~ a position of a manipulandum of a first haptic feedback device;

causing a first haptic feedback signal to be sent to a second haptic feedback device from said second computer, said first haptic feedback signal being based, at least in part, on said first computer information, wherein said first haptic feedback signal causes said second haptic feedback device to output a haptic sensation ~~force~~;

sending a second computer information to said first computer from a second network interface of said second computer over said network, wherein said second computer information comprises ~~position information describing~~ a position of a manipulandum of a second haptic feedback device; and

causing a second haptic feedback signal to be sent to said first a haptic feedback device from said first computer, said second haptic feedback signal being based, at least in part, on said second computer information, wherein said haptic feedback signal causes said first haptic feedback device to output a force.

39. (Previously Presented) A method as recited in claim 38 wherein said first computer information includes haptic feedback information indicating a tactile sensation to be output by said second haptic feedback device, and wherein said second computer information includes haptic feedback information indicating a tactile sensation to be output by said second haptic feedback device.

40. (Currently Amended) A method as recited in claim 39 wherein said first computer and said second computers each produce ~~display~~ a graphical environment having a first graphical object controlled by a ~~said~~ first user and a second graphical object controlled by a ~~said~~ second user.

41. (Cancelled)

42. (Currently Amended) A method as recited in claim 38 further comprising accessing a server computer with one of said first and second computers and downloading a feel sensation information from said server computer, said feel sensation information to be included in said first computer information or said second computer information.

43. (Currently Amended) A method as recited in claim 42 wherein said server computer provides a web page ~~downloaded~~ to said computer accessing said server, said web page including an embedded feel sensation information.

Claims 44-57 (Cancelled)

58. (Currently Amended) A method for providing haptic feedback comprising:

receiving a first computer information from a first computer at a network interface of a server computer over a network;

providing said first computer information to a second computer, wherein said first computer information comprises information operable to update a simulated graphical object in a graphical environment output by said second computer, and wherein at least one of said second computer and said server computer uses said first computer information to update a game

program running on at least one of said second computer and said server computer, and wherein said second computer provides a second haptic feedback signal based at least in part on said first computer information to a second haptic feedback device;

receiving a second computer information from said second computer at said network interface server computer over said computer network; and

providing said second computer information to said first computer, wherein said second computer information comprises information operable to update a simulated graphical object in a graphical environment output by said first computer, and wherein at least one of said first computer and said server computer uses said second computer information to update a game program running on at least one of said first computer and said server computer, and wherein said first computer provides a first haptic feedback signal based at least in part on said second computer information to a first haptic feedback device.

59. (Previously Presented) A method as recited in claim 58 wherein said first computer information includes force information describing a tactile sensation, wherein said tactile sensation is output by said second haptic feedback device.

60. (Previously Presented) A method as recited in claim 58 further comprising sending tactile sensation data stored on said server computer to said first computer.

61. (Previously Presented) A method as recited in claim 58 wherein said first computer information comprises position data allowing said second computer to display a graphical object in said graphical environment output by said second computer.

62. (Previously Presented) A method as recited in claim 58 wherein said server computer runs a web page.

63. (Previously Presented) A method as recited in claim 58 wherein updating said game program running on said first computer includes updating a location of a displayed player graphical object based at least in part on said second computer information.

64. (Previously Presented) A method as recited in claim 58 wherein said updating of said game program running on said first computer includes updating a location of a projectile.

65. (Previously Presented) A method as recited in claim 64 wherein said projectile is a ball or a puck.

66. (Previously Presented) A method as recited in claim 63 wherein said displayed player graphical object represents a sporting object.

67. (Previously Presented) A method as recited in claim 66 wherein said displayed player graphical object includes a weapon.

68. (Previously Presented) A method as recited in claim 63 wherein a collision between said player graphical object and a different graphical object is detected, and wherein said first haptic feedback signal is based at least in part on said detected collision.

69. (Previously Presented) A method as recited in claim 68 wherein said different graphical object is a projectile.

70. (Previously Presented) A method as recited in claim 68 wherein said different graphical object is an obstruction in said game environment.

Claim 71. (Cancelled)

72. (Previously Presented) A method as recited in claim 75 wherein said first computer is a client computer and said second computer is a server computer.

73. (Previously Presented) A method as recited in claim 75 wherein said first computer and said second computer are client computers.

74. (Currently Amended) A method as recited in claim 75 wherein said first information received from said second computer includes web page information.

75. (Currently Amended) A method for providing haptic feedback over a computer network comprising:

receiving first information at a first network interface of a first computer from a second computer over a network, said first information comprising haptic feedback information and position information for a graphical object displayed by said second computer;

using said first information to repeatedly update a visual display coupled to ~~running on~~ said first computer, and wherein said first computer repeatedly provides a haptic feedback signal based at least in part on said haptic feedback information to a haptic feedback device, wherein said haptic feedback device outputs a tactile sensation based, at least in part, on said haptic feedback signal and correlated with said updated visual display; and

sending a second information from said first network interface ~~computer~~ to said second computer over said computer network.

76. (Previously Presented) A method as recited in claim 73 wherein said haptic feedback device is a first haptic feedback device, and wherein said second computer includes a second haptic feedback device providing computer-controlled physical tactile sensations to a user of said second haptic feedback device.

Claim 77. (Cancelled)

78. (Previously Presented) A method as recited in claim 75 wherein said visual display is updated by moving a graphical object within a graphical game environment based, at least in part, on position data received from said haptic feedback device, where a collision between said graphical object and a different graphical object can be detected to cause said tactile sensation to be output.

79. (Currently Amended) A method as recited in claim 75 wherein said first computer receives an indication of a gaming event in said first information, said first computer synchronizing said visual display associated with said gaming event with said tactile sensation that is associated with said gaming event.

80. (Previously Presented) A method as recited in claim 79 wherein said gaming event is a collision.

81. (Previously Presented) A method as recited in claim 79 wherein said gaming event is an explosion.

82. (Previously Presented) A method as recited in claim 79 wherein said visual display is updated at a rate substantially faster than said tactile sensation.

Claims 83-91. (Cancelled)

92. (Previously Presented) A method as recited in claim 101 wherein said local model of said particular client computer also receives button data from said associated haptic feedback device, said button data describing a state of at least one button on said associated haptic feedback device.

93. (Previously Presented) A method as recited in claim 101 wherein said first graphical object is a representation of sporting equipment.

94. (Previously Presented) A method as recited in claim 93 wherein said second graphical object is a representation of a ball or puck.

95. (Previously Presented) A method as recited in claim 101 wherein said first graphical object includes a representation of a weapon.

96. (Previously Presented) A method as recited in claim 101 wherein each of said local models of said computer-gaming simulation of said multiple client computers displays a graphical object having a location influenced by position data received from an associated interface device in communication with each client computer.

97. (Cancelled)

98. (Currently Amended) A method as recited in claim 101 wherein a sound is associated with an event occurring in said computer-gaming simulation, wherein said computer synchronizes an the output of said sound with said tactile sensation that is associated with said event.

99. (Previously Presented) A method as recited in claim 98 wherein said event is a collision in said computer-gaming simulation.

100. (Previously Presented) A method as recited in claim 98 wherein said event is an explosion in said computer-gaming simulation.

101. (Currently Amended) A method comprising:

executing a first local model of a computer-gaming simulation on a first computer with a first network interface;

executing, substantially simultaneously with said first local model, a second local model of said computer-gaming simulation on a second computer with a second network interface in communication with said first network interface ~~computer~~ over the Internet;

updating a location of a first graphical object of said first local model based at least in part on position data output by a sensor in communication with a haptic input device in communication with said first computer, said haptic input device comprising an actuator configured to output haptic feedback to said haptic input device;

updating a location of a second graphical object based at least in part on information received over said Internet from said second network interface of said second computer, said information comprising a gaming event; and

determining, by said first computer, whether said first graphical object and said second graphical object interact, and, if so:

determining a haptic effect to be output, and

outputting said haptic effect to said haptic input device, said haptic effect configured to be substantially synchronized with said gaming event.

102. (New) A system comprising:

a first computer, said first computer comprising:

a first processor,

a first network interface coupled to said first processor and in communication with a network,

a first memory coupled to said first processor,

a first force feedback device in communication with said first processor, said first force feedback device configured to provide a first input signal, said first force feedback device coupled to a first actuator, said first actuator configured to provide tactile sensations in response to a first haptic feedback signal, and

wherein said first processor is configured to:

produce a first image, and

provide said first haptic feedback signal to said first force feedback device, said first image and said first haptic feedback signal based at least in part on a first information received from a second computer and based at least in part on said first input signal; and

said second computer comprising:

a second processor,

a second network interface coupled to said second processor, said second network interface in communication with a network,

a second memory coupled to said second processor,

a second force feedback device coupled to said second processor, said second force feedback device configured to provide a second input signal, said second force feedback device coupled to a second actuator, said second actuator configured to provide a tactile sensation in response to a second haptic feedback signal, and

wherein said second processor is configured to:

produce a second image, and

provide said second haptic feedback signal to said second interface device, said second image and said second haptic feedback signal based at least in part on a second information received from said first computer and based at least in part on said second input signal.

103. (New) A system comprising:

a first computer, comprising:

a first processor capable of generating a first image signal;

a first network interface capable of communication with a network,

a first force feedback device capable of providing a first input signal, comprising:

a first actuator configured to provide tactile sensations in response to a first haptic feedback signal, and

said first image signal and said first haptic feedback signal based at least in part on a first information received from a second computer and based at least in part on said first input signal; and

said second computer, comprising:

a second processor capable of generating a second image signal;

a second network interface capable of communication with the network,

a second force feedback device capable of providing a second input signal to said second processor, comprising:

a second actuator configured to provide tactile sensations in response to a second haptic feedback signal, and

said second image and said second haptic feedback signal based at least in part on a second information received from said first computer and based at least in part on said second input signal.

104. (New) A system as recited in claim 103 wherein said first force feedback device is coupled to a manipulandum configured to move in two degrees of freedom.

105. (New) A system as recited in claim 104 wherein said first force feedback device is coupled to a third processor, the third processor in communication with the first processor includes a local controller that communicates with said first computer, a plurality of actuators for providing said tactile sensations, and at least one sensor for sensing positions of said user manipulatable object.

106. (New) A system as recited in claim 104 wherein said manipulandum is manipulable by a finger of a user.

107. (New) A system as recited in claim 105 wherein said haptic feedback signal includes a haptic feedback command that can be parsed by said local controller such that said controller can control said actuators in response to said haptic feedback command in a control loop with said sensors.

108. (New) A system as recited in claim 103 wherein said first computer and said second computer communicate with at least one server computer over said network, wherein said information received from said first computer and said information received from said second computer are communicated via said server.

109. (New) A system as recited in claim 103 wherein said first image includes a graphical object that can interact with a projectile.

110. (New) A system as recited in claim 103 wherein said first image comprises a first graphical object and a second graphical object, the first graphical object having a location based, at least in part, on a position information received from said first force feedback device, said first graphical object able to collide with said second graphical object said second graphical object having a location based at least in part on said first information received from said second computer.

111. (New) A system as recited in claim 103 wherein said first image includes a graphical object having a location based, at least in part, on position information received from first second

force feedback device, said graphical object able to collide with an obstruction displayed in said first image.

112. (New) A device comprising:

a first computer, the first computer comprising:

a first processor configured to generate a haptic feedback information and a first graphical object information, the haptic feedback information based at least in part on a position information and a second graphical object information, the first graphical object information based at least in part on the position information,

a first network interface coupled to the first processor and in communication with a network, the first network interface configured to receive the second graphical object information from the network,

a first memory coupled to the first processor, and

a force feedback device comprising:

a second processor in communication with the first computer, the second processor configured to receive the haptic feedback information from the first computer

a manipulandum configured to be manipulated in at least one degree of freedom and configured to control a position of a first graphical object,

at least one sensor coupled to the second processor, the at least one sensor configured to detect a position of the manipulandum, the at least one sensor further configured to generate the position information based on the position of the manipulandum, and

an actuator coupled to the second processor, the actuator configured to output a haptic sensation, the haptic sensation based at least in part on the haptic feedback information.

113. (New) A device as recited in claim 112 further comprising a visual display coupled to the first processor, the visual display configured to display a first graphical object and a second graphical object, the display of the first graphical object based at least in part on the first graphical object information, the display of the second graphical object based at least in part on the second graphical object information.

114. (New) A device as recited in claim 112 wherein said second graphical object information is received by said first network interface from a server computer connected to said network.

115. (New) A device as recited in claim 112 wherein said second graphical object information is received by said first network interface from a client machine connected to said network.

116. (New) A device as recited in claim 113 wherein said server computer and said first network interface communicate over said network using TCP/IP protocols.

117. (New) A device as recited in claim 112 wherein said haptic feedback information includes at least one command, and wherein said second processor parses said command to control said actuator.

118. (New) A device as recited in claim 112 further comprising a button input device having a state responsive to manipulation, wherein said state is provided to said second processor, and wherein said state is provided to the first computer from said second processor.

119. (New) A device as recited in claim 113 wherein said manipulandum is constrained to move in two planar degrees of freedom, wherein said actuator is a first voice coil actuator, and further comprising a second voice coil actuator, wherein said first graphical object is controlled by the manipulandum.